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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/033,952	12/28/2001	Peter Michael Edic	RD-29,086	8581

41838 7590 09/14/2005

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EXAMINER

UPRETI, ASHUTOSH

ART UNIT PAPER NUMBER

2623

DATE MAILED: 09/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/033,952

Applicant(s)

EDIC ET AL.

Examiner

Ashutosh Upreti

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12 and 24 is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-11, 13-17 and 20-23 is/are rejected.
- 7) ☒ Claim(s) 5, 6, 18 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment and Arguments

Applicant's amendment filed June 23, 2005, has been entered and made of record.

In view of applicant's newly submitted drawings, the objections to the drawings are withdrawn.

In view of applicant's amendment, the objections to the claims are withdrawn.

Applicant's arguments, see pages 11-13, filed on June 23, 2005, with respect to the rejection(s) of claim(s) 1-4, 8-10, 13-17, 21 and 22 under 35 U.S.C. 102 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of a combination of the previously applied reference, Horiuchi (U.S. Patent 5,991,356) with a new reference Pohlman (U.S. Patent 6,512,807) which teaches temporal filtering of 3D images on a pixel-by-pixel basis.

Applicant's arguments with respect to claims 7, 11, 20 and 23 have been considered but are moot in view of the new ground(s) of rejection (see above).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4, 8-10, 13-17, 21 and 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Horiuchi (U.S. Patent 5,991,356) in view of Pohlman (U.S. Patent 6,512,807).

Claims 1-4, 8-10, 13-17, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Horiuchi (U.S. Patent 5,991,356).

As to claim 1, Horiuchi discloses scanning a cyclically moving object (column 2, line 48, here a heart beats in cycles) with a CT imaging system (column 4, line 54) including at least one of an area detector and a linear detector to encompass the desired field of view (column 4, line 67 – these are read as area detectors as they are used to detect an area) and a rotating gantry (column 5, line 20) to measure projection data during a plurality of cycles of the cyclically moving object (Figure 15); dividing a period of the cyclically moving object into a discrete number of phases (column 11, line 56); identifying an initial set of projection data at a desired phase of a first cycle (column 11, line 19) at a first angle (column 11, lines 8-9); identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle (column 12, line 31-34 and Figure 15); combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a three-dimensional image (column 10, lines 59-62. Here if all slices are combined, as can be done, the initial set must be included. Also, since this is being done by software on a computer, the use of an algorithm is inherent); repeating said identifying an initial set of projection data at a desired phase of a first cycle at a first angle, identifying at least one subsequent set of projection data at

the same desired phase of a subsequent cycle at an angle that is different from the first angle, and combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a collection of three-dimensional images for the desired phases (column 10, lines 61-62 – here it is disclosed that this entire process, described previously, can be repeated at every phase in the cycle).

Horiuchi does not expressly disclose temporally filtering the collection of three-dimensional images on a pixel by pixel basis.

Pohlman discloses temporally filtering a collection of three-dimensional images on a pixel by pixel basis (column 6, lines 23-27).

It would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to use the filtering of Pohlman, when processing the images of Horiuchi, as they both involve medical imaging with CT scanners. Doing so would reduce the errors caused by noise (Pohlman, column 2, lines 58-59), thus providing motivation.

As to claim 2, Horiuchi as modified above further discloses that one rotation of the gantry is 360 degrees (column 10, line 41).

As to claim 3, Horiuchi as modified above further discloses that the object is a patients heart (column 2, line 38) and that the cycle represents the cardiac cycle (Figure 15) and that phase divisions (see claim 1 rejection) are done in accordance with the patients ECG signal (column 5, line 29).

As to claim 4, Horiuchi as modified above further discloses that one rotation is within one breath of a patient (Figures 10 and 11 and column 9, lines 52-56). Here the respiration information is obtained and the scan (one or more rotations) is completed when the breath is held to minimize movement.

As to claim 8, Horiuchi as modified above further discloses that one gantry rotation is completed during the data acquisition window (Figure 13). Here the time for one scan (0 to T) is shown to be the same as a full rotation (0 to 2π).

As to claim 9, Horiuchi as modified above further discloses obtaining data from a continuous scan that may last over a plurality of rotations (column 10, lines 45-47).

As to claim 10, Horiuchi as modified above further discloses rotating the gantry (column 7, lines 2-4) an angular range (column 11, line 60, here the range is a half-scan) to utilize a segment reconstruction technique (column 11, lines 64).

As to claim 13, the limitations of the claim are rejected for the same reasons as in the rejection for claim 1.

As to claim 14, the limitations of the claim are rejected for the same reasons as in the rejection for claim 2.

As to claim 15, the limitations of the claim are rejected for the same reasons as in the rejection for claim 9.

As to claim 16, the limitations of the claim are rejected for the same reasons as in the rejection for claim 3.

As to claim 17, the limitations of the claim are rejected for the same reasons as in the rejection for claim 4.

As to claim 21, the limitations of the claim are rejected for the same reasons as in the rejection for claim 8.

As to claim 22, the limitations of the claim are rejected for the same reasons as in the rejection for claim 10.

Claims 7, 11, 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Horiuchi and Pohlman as applied to claim 1 above, and further in view of Tuy (U.S. Patent 5,243,664).

As to claim 7, the combination of Horiuchi and Pohlman as applied above does not expressly disclose forward projecting data from a region outside the object, subtracting the forward projected data from the total data for each view angle and reconstructing the residual data to minimize artifacts.

Tuy discloses, forward projecting data for a region of an image (column 5, lines 33-35) and then subtracting it from the total data (column 5, lines 36-39) to minimize artifacts (column 4, line 63).

It would have been obvious to a person of ordinary skill in the art to use the forward projection and subtraction techniques of Tuy when processing the images of each view angle from the combination of Horiuchi and Pohlman as they both deal with images from CT scanners. This would help minimize artifacts in the image, thus providing motivation to a person of ordinary skill in the art.

As to claim 11, the combination of Horiuchi and Pohlman as applied above does not expressly disclose reconstructing a collection of volumetric images using iterative methods.

Tuy discloses reconstructing a collection of volumetric images using iterative methods (Figure 1, 20, 30, 34 and 42 are iterations in image reconstruction). Tuy takes images from a CT scanner, which is known by people of ordinary skill in the art, to take a collection of images that are combined to form a 3D image.

It would have been obvious to a person of ordinary skill in the art to use the iterative reconstruction techniques of Tuy when processing the images of each view angle from the combination of Horiuchi and Pohlman as they both deal with images from CT scanners. This would help minimize artifacts in the image, thus providing motivation to a person of ordinary skill in the art.

As to claim 20, the limitations of the claim are rejected for the same reasons as in the rejection for claim 7.

As to claim 23, the limitations of the claim are rejected for the same reasons as in the rejection for claim 11.

Allowable Subject Matter

Claims 12 and 24 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

The combination of a single high-resolution detector and a plurality of low-resolution detectors on a CT system was not found in the prior art. The other limitations in claims 12 and 24 are discussed in the rejections for claims 1, 3 and 7.

Claims 5, 6, 18 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claims 5, 6, 18 and 19, the combination of a single high-resolution detector and a plurality of low-resolution detectors on a CT system was not found in the prior art. Regarding claims 6 and 19, the aspects regarding encompassing the heart and surrounding region in the scan are discussed further in Chao (cited below).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Zhao (U.S. Patent 6,775,400) discloses temporal filtering on a pixel by pixel basis (column 5, lines 6-11) and indicates that the images are multi-dimensional, which the examiner considers to include three-dimensional images (column 1, lines 53-56).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ashutosh Upreti whose telephone number is (571) 272-7428. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AU

AU
September 6, 2005

JINGGE WU
PRIMARY EXAMINER